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EXAMINER

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DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-22 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9 and 11-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shattil (U.S.Pub-20030147655) in view of Sugar et al. (U.S.Pat-6785520).

Regarding claim 1, Shattil teaches a method comprising:

receiving information for transmission to a receiver (fig.4a-4c, input data 412, plurality of carrier mixers 414n, 416n, 418n, paragraph 0100); and

generating a plurality of sub-carriers (fig.4a-4c, plurality of carrier mixers 414n, 416n, 418n) to redundantly transmit the information over a multi-carrier wireless communication channel (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122),

Shattil fails to specifically disclose wherein each of the sub-carriers is to be transmitted over an array of two or more antenna, wherein each of the sub-carriers is modified by a set of complex weights to ensure that each of the sub-carriers of the

wireless communication channel propagates along a different physical path to the receiver, wherein the set of complex weights used to modify each of the sub-carriers includes different weights for each of the two or more antenna of the array. However, Sugar teaches wherein each of the sub-carriers is to be transmitted over an array of two or more antenna (fig.8 and 10, col.1, lines 44-57, col.4, lines 1-13), wherein each of the sub-carriers is modified by a set of complex weights to ensure that each of the sub-carriers of the wireless communication channel propagates along a different physical path to the receiver (fig.1, col.2, line 60 to col.3, line 39), wherein the set of complex weights used to modify each of the sub-carriers includes different weights for each of the two or more antenna of the array (fig.1, col.9, line 45 to col.10, line 17, col.4, lines 1-13). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the teaching of the Sugar to Shattil to provide a method for reducing power requirements at each antenna.

Regarding claim 2, Shattil and Sugar further teach a method according to claim 1, wherein each element of the set of complex weights scales one or more of a sub-carriers amplitude and/or phase at an associated transmission antenna (see Sugar, col.9, line 45 to col.10, line 17).

Regarding claim 3, Shattil and Sugar further teach a method according to claim 1, further comprising developing a set of complex weights including (see Shattil, fig.15, paragraph 0213-0214, see Sugar, col.9, line 45 to col.10, line 17):

choosing substantially different weights (see Sugar, col.2, line 60 to col.3, line 39), for each sub-carrier sharing information (see Shattil, fig.4a-4c, and 15 plurality of carrier mixers 414n, 416n, 418n, 422n (sub-carriers/different paths), abstract, paragraph 0100); and iteratively repeating until all sub-carriers have been modified (see Shattil, fig.4a-4c, paragraph 0106).

Regarding claim 4, Shattil and Sugar further teach a method according to claim 3, wherein the substantially different weights are chosen to be orthogonal to the others (see Shattil, paragraph 0147, 0149).

Regarding claim 5, Shattil and Sugar further teach a method according to claim 3, wherein developing a set of complex weights (see Shattil, fig.15, paragraph 0213-0214) comprises: selecting weight vector(s) to be applied to each of the sub-carriers from a pre-determined set of weight vectors (see Sugar, col.9, line 45 to col.10, line 17).

Regarding claim 6, Shattil and Sugar further teach a method according to claim 1, further comprising: transmitting the modified sub-carriers (see Sugar, fig.1, col.9, line 45 to col.10, line 17, col.4, lines 1-13).

Regarding claim 7, Shattil teaches a transceiver comprising:

a diversity agent (fig.4c, diversity 470, paragraph 0004, 0122), operable to selectively apply a set of complex weight values to each of a plurality of signals (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122), each corresponding to a sub-carrier of a multi-carrier communication channel (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122), to

introduce spatial diversity between such sub-carriers (fig.4c, diversity 470, paragraph 0004, 0122); and

a transmit module (fig.4c, and 5b, antennas 424n), operable coupled with the diversity agent (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122), to receive the modified sub-carriers (fig.4a-4c, input data 412, plurality of carrier mixers 414n, 416n, 418n, paragraph 0100) and transmit the signals to generate the multi-carrier communication channel with intra-channel spatial diversity (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122).

Shattil fails to specifically disclose wherein each of complex weight values include a plurality of weight values each associated with a different one of a plurality of antennae of an antenna array through which the sub-carriers are transmitted. However, Sugar teaches wherein each of complex weight values include a plurality of weight values (col.2, line 60 to col.3, line 39) each associated with a different one of a plurality of antennae of an antenna array through which the sub-carriers are transmitted (fig.1, col.9, line 45 to col.10, line 17, col.4, lines 1-13). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the teaching of the Sugar to Shattil to provide a method for reducing power requirements at each antenna.

Regarding claim 8, Shattil and Sugar further teach a transceiver according to claim 7, wherein the plurality of signals received from at the diversity agent are baseband signals (see Shattil, paragraph 0004, 0100).

Regarding claim 9, Shattil and Sugar further teach a transceiver according to claim 7, wherein the multi-carrier communication channel is comprised of a plurality of sub-carrier signals (), each having a disparate set of complex weights introduced at a baseband of the sub-carriers to effect the spatial diversity between the sub-carriers (see Shattil, paragraph 0004, 0100, fig.1, see Sugar, col.9, line 45 to col.10, line 17, col.4, lines 1-13).

Regarding claim 11, Shattil and Sugar further teach a transceiver according to claim 7, wherein the transceiver is operable to develop the set of complex weight values for a given baseband signal to be maximally orthogonal complex weight values applied to another baseband signal (see Shattil, paragraph 0147, 0149).

Regarding claim 12, Shattil and Sugar further teach a transceiver according to claim 7, wherein the transceiver is operable to develop a set of complex weight vectors for a sub-carrier (see Shattil, fig.4a-4c, diversity 470, paragraph 0004, 0122, see Sugar, fig.1, col.2, line 60 to col.3, line 39, col.4, lines 1-13) that are substantially different from weight vectors modifying other sub-carriers that include at least a subset of information carried by the sub-carrier (see Sugar, fig.1, col.2, line 60 to col.3, line 39, col.4, lines 1-13).

Regarding claim 13, Shattil and Sugar further teach a transceiver according to claim 7, wherein the transmit module is operable to upconvert and amplify each of the modified baseband signals to generate a plurality of spatially diverse sub-carriers (see Shattil, fig.4c, paragraph 0113).

Regarding claim 14, Shattil and Sugar further teach a transceiver according to claim 13, wherein the transmit module operable to transmit each of the sub-carriers to one or more receiver(s) (see Sugar, fig.1, col.2, line 60 to col.3, line 39, col.4, lines 1-13).

Regarding claim 15, Shattil teaches a transceiver according to claim 7, further comprising: a memory operable to store content (see Shattil, paragraph 0124, 0156); and control logic, coupled to the memory (see Shattil, paragraph 0124, 0156), operable to access and process at least a subset of the content to implement the diversity agent (see Shattil, fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0004, 0198).

Regarding claim 16, Shattil and Sugar further teach the method of claim 1, wherein the multi-carrier wireless communication channel uses Orthogonal Frequency Division Multiplexing (OFDM) (see Shattil, paragraph 0147, 0149).

Regarding claim 17, Shattil and Sugar further teach the transceiver of claim 7, wherein the multi-carrier communication channel uses Orthogonal Frequency Division Multiplexing (OFDM) (see Shattil, paragraph 0147, 0149).

Regarding claim 18, Shattil and Sugar further teach the transceiver of claim 7, wherein the transceiver is selected from a base station and a wireless telephony subscriber unit (see Shattil, abstract).

Regarding claim 19, Shattil and Sugar further teach the transceiver of claim 7, wherein the transceiver develops the set of complex weights to have inter-channel spatial diversity (see Shattil, paragraph 0004, 0122) with respect to at least one

communication channel of at least one other transceiver (see Sugar, fig.1, col.2, line 60 to col.3, line 39, col.4, lines 1-13).

Regarding claims 20 and 22, Shattil teaches a subscriber unit (a device) comprising:

a diversity agent (fig.4c, diversity 470, paragraph 0004, 0122), operable to selectively apply a set vector of complex weight values to each of a plurality of signals (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122), each corresponding to a sub-carrier of a multi-carrier communication channel (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122), to introduce spatial diversity between such sub-carriers (fig.4c, diversity 470, paragraph 0004, 0122); and

a transmit module (fig.4c, and 5b, antennas 424n), coupled with the diversity agent (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122), operable to receive the modified sub-carriers (fig.4a-4c, input data 412, plurality of carrier mixers 414n, 416n, 418n, paragraph 0100) and transmit the signals to generate the multi-carrier communication channel with intra-channel spatial diversity (fig.4a-4c, plurality of carrier mixers 425n, antennas 424n, paragraph 0118-0119, 0122).

Shattil fails to specifically disclose wherein the vector of complex weight values applied to each signal includes a plurality of different complex weight values, and wherein each of the different complex weight values is operable to modify both an amplitude and a phase of a respective signal. However, Sugar teaches wherein the vector of complex weight values applied to each signal includes a plurality of different

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complex weight values (col.2, line 60 to col.3, line 39), and wherein each of the different complex weight values is operable to modify both an amplitude and a phase of a respective signal (fig.1, col.9, line 45 to col.10, line 17, col.4, lines 1-13). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the teaching of the Sugar to Shattil to provide a method for reducing power requirements at each antenna.

Regarding claim 21, Shattil and Sugar further teach a transceiver according to claim 7, wherein each of the set of complex weight values are comprised of a plurality of weight values each (see Sugar, fig.1, col.2, line 60 to col.3, line 39, col.4, lines 1-13) associated with one of a plurality of antennae comprising an antenna array through which the sub-carriers are transmitted (see Sugar, fig.1, col.2, line 60 to col.3, line 39, col.4, lines 1-13).

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khai M. Nguyen whose telephone number is 571.272.7923. The examiner can normally be reached on 8:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Feild can be reached on 571.272.4090. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Khai Nguyen
Au: 2617

3/27/2007

JOSEPH FEILD
SUPERVISORY PATENT EXAMINER